

I - Problem Statement Title (GS024)

Determine the amount of inherent column cage stability for erecting bridge column cages during construction based on current fabrication practice

II - Research Problem Statement

Question: What would be the minimum requirement for tying and/or bracing a bridge concrete column-reinforcing cage to prevent damage from racking or collapse during the construction process?

During the construction of bridge concrete columns, there is an interim time period between when the reinforcement cage is set in place and the column forming system is placed around the cage and secured. During this period, the reinforcement cage is susceptible to racking and collapse. There currently are no guidelines or specifications to control this condition.

III – Objective

STAP Roadmap Outcome: 9. Nationally Accepted Specification Advanced for Implementation in California

Develop an analysis tool and specification to accurately predict and control the properties of “tied” bridge column reinforcement cages, which would reduce the potential of failures and collapses. This would contribute to the Department’s goal of achieving the best safety record in the nation.

IV - Background

Since the advent of hoop reinforcement in lieu of spiral reinforcement we have seen a greater incident rate of column cage assemblages racking during picking and placing operations. While less frequent, spiral reinforced column cages could and would occasionally rack as well. To date, there has been no definitive research done which would give the engineer a greater understanding of the transient forces at work, the anticipated stability of bridge concrete column reinforcing cages, and provide a basis for determining a minimum number of ties and/or template reinforcement to prevent collapse.

V. Statement of Urgency and Benefits

A. Support of the Department’s Mission/Goals:

(Improving Mobility: Safety, Reliability and Performance)

Benefits would include greater reliability in predicting the elastic behavior of the column cages during this interim period and thus enable the development of minimum standards to prevent collapse. This improvement would greatly enhance worker safety and provide a finished product, which would better reflect the designer’s intended shape of the final product.

B. Return on Investment:

Since this type of heavy civil construction usually involves large cranes and closure of existing travel ways, preventing just one occurrence could have the potential savings of a hundred thousand dollars or more in addition to lost travel time if the occurrence involves the extended closure of the travel way due to mangled reinforcement. Predictability in performance of column cages would be recognized by insurance companies and contractors alike and would lead to lower bid items.

VI – Related Research

None known.

VII – Deployment Potential

The Departments Standard Specifications and Structure design Manual will be updated based on project results.